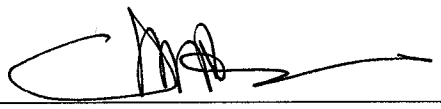
EXHIBIT 1

VERIFICATION OF TRANSLATION

I, Chiaki Kokka, at Knobbe, Martens, Olson & Bear, LLP, hereby declare that I am the translator of the English language document attached and certify that, to the best of my knowledge and belief, the attached document is a true and correct English translation of the Japanese Patent Application No. 2002-215615, filed July 24, 2002.

Date: 04-22-10

Signature: 

NAGACO1.001APC
English Translation of JP 2002-215615

Title of Document: Specification

Title of Invention: GUM BASE COMPOSITIONS

Scope of Claim for Patent:

Claim 1. A gum base composition comprising biodegradable ingredients, wherein the said biodegradable ingredients include a polylactic acid in the amount of from 10% by weight to less than 50% by weight.

Claim 2. The gum base composition according to Claim 1, wherein the weight average molecular weight of the said polylactic acid is 50,000 to 200,000.

Disclosure of Invention:

[0001]

[FIELD OF THE INVENTION]

The present invention relates to gum base compositions comprising a biodegradable component. More specifically, the present invention relates to gum base compositions containing polylactic acid in the amount of from 10% by weight or more to no more than 50% by weight in the biodegradable component.

[0002]

[BACKGROUND TECHNOLOGY]

Chewing gum typically comprises two major ingredients, namely a chewable ingredient such as a gum base and a non-chewable ingredient including sweetening agents, softening agents, flavoring agents, and the like. The gum base is a masticatory substance, which insoluble in the saliva, comprising a blend of natural and/or synthetic rubbers, natural and/or synthetic resins, fillers, plasticizers, emulsifiers, waxes, and the like. On the other hand, the non-chewable ingredient includes substances which are readily soluble and mostly dissolve out into the mouth upon chewing.

[0003]

Since the gum base is not dissolved by saliva, it remains as it is for a long period of time when chewing gum is discarded in an environment such as on the street after being chewed, thus causing an environmental pollution. A method of replacing ingredients in the gum base with disintegratable or biodegradable ingredients has been proposed as one way to reduce such an impact of chewing gum onto the environment.

[0004]

Japanese Patent Application Laid-open No. H6-7090 suggests that a gum base which is susceptible to biodegradation can be obtained by replacing a paraffin component, which is uses as a wax in a gum base, with a triglyceride composition having a specific fatty acid composition. However, this gum base cannot provide a fundamental solution to the pollution problem since it also contains non-degradable components other than the wax, synthetic elastomers, in particular, which remain in the environment.

[0005]

In imparting disintegratability and biodegradability to a gum base, there rises a problem that non-degradable synthetic rubbers and resins, particularly butyl rubber and polyvinyl acetate, are used. They are used as a major component of the gum base because of their durability and convenience. This problem ahs been solved by using a natural rubber in place of butyl rubber; however, replacement of polyvinyl acetate is not easy in terms of texture and processibility. Accordingly, in order to impart disintegratability and biodegradability to a gum base, there is a need for a material which has a function comparable to that of polyvinyl acetate and at the same time is disintegratable or biodegradable.

[0006]

Japanese Patent Application Laid-open No. H8-196214 discloses that a biodegradable chewing gum can be obtained by using biodegradable polymer in a gum base. In this way, biodegradability can be imparted to the entire gum base. However, since the glass transition temperature of this gum base is 37°C at the highest, a bum base with a soft chewing texture only can be obtained.

[0007]

[PROBLEMS TO BE SOLVED]

The present invention intends to provide a gum base composition which has an excellent chewing texture and is excellent in disintegratability and biodegradability.

[0008]

[MEANS FOR SOLVING PROBLEMS]

The present invention provides a gum base composition comprising biodegradable ingredients, wherein said biodegradable ingredients include a polylactic acid in the amount of from 10% by weight to less than 50% by weight.

[0009]

According to a preferable embodiment of the present invention, the weight average molecular weight of the said polylactic acid is 50,000 to 200,000. More preferably, the softening temperature of the polylactic acid is 50-80 °C.

[0010]

[MODE OF CARRYING OUT THE INVENTION]

A gum base composition of the present invention is explained as follows. Meanwhile, the compositions explained hereinafter are not to be construed to limit the scope of the invention, and it is to be understood by the skilled in the art that various changes are possible with in the spirit of the invention.

[0011]

A gum base composition of the present invention is a gum base composition comprising biodegradable ingredients, wherein the biodegradable ingredients include a polylactic acid in the amount of 10% by weight to less than 50% by weight. In the present specification, biodegradable ingredients refer to ingredients which can be hydrolyzed by physiologically active substances of organisms, particularly microorganisms. Accordingly, a gum base composition of the present invention comprises a polylactic acid, which is a biodegradable ingredient, as an essential component, and other ingredients such as biodegradable natural rubbers, resins, fillers, plasticizers and/or emulsifiers, and waxes. A gum base composition of the present invention is explained in detail as follows.

[0012]

(A) Polylactic Acid

Polylactic acid is an aliphatic polyester in which lactic acid is polymerized, which can be degraded into carbon dioxide and water in an environment by microorganisms and thus have attracted an attention as a plastic that creates a little stress on an environment and can be reused as a resource. Polylactic acid is expected to be useful in films, sheets for vacuum injection molding and foam sheets, paper coating process, fibers, and the like (Shimadzu Hyoron, vol. 53, No. 1, 1996. 6).

[0013]

Polylactic acid can be obtained, for example, by making L-lactic acid and/or D-lactic acid into lactide, which is a cyclic dimer, and then subjecting it to ring-opening polymerization, or by dehydrating L-lactic acid and/or D-lactic acid in an organic solvent.

[0014]

The preferred weight average molecular weight of a polylactic acid used in a gum base composition of the present invention is 50,000 to 200,000, more preferably 100,000 to 150,000. Its elasticity may be lost when the weight average molecular weight is smaller than 50,000, whereas its elasticity may be too strong when the weight average molecular weight exceeds 200,000; and the results are not desirable. The weight average molecular weight of the polylactic acid can be controlled, for example, by the concentration of alcohol-type polymerization initiator.

[0015]

Further, in view of an appropriate chewing texture, the softening temperature of the aforesaid polylactic acid is preferably 50 to 80 °C, more preferably 55 to 70 °C.

[0016]

A gum base composition of the present invention contains a polylactic acid in the amount of 10% by weight to less than 50% by weight in a biodegradable component which composes the said composition. The content is more preferably 20 to 40% by weight. When the polylactic acid content is less than 10% by weight, the biodegradability markedly decreases. Further, when the polylactic acid content is 50% or more by weight, the chewing texture becomes deteriorated and concurrently the amount of ingredients necessary for lasting flavor is insufficient, and thus it is difficult to maintain a quality as chewing gum.

[0017]

A gum base composition of the present invention contains ingredients such as natural rubbers, resins, fillers, plasticizers and/or emulsifiers, and waxes in the amount of 50% or more by weight; and these ingredients are all biodegradable. Chewing gum made using this composition is disintegrated in the environment and biologically degraded, and thus, the environmental problem can be solved and at the same time an appropriate chewing texture and long-lasting flavor can be imparted. Further, workability upon processing the gum base composition into a chewing gum can be improved. Disintegration of chewing gum in the present context is caused by hydrolysis, photolysis, and the like in the environment, which have an effect

to accelerate degradation by microorganisms. These ingredients can be appropriately selected according to the characteristics of the gum base composition.

[0018]

(B) Natural Rubbers

Natural rubbers are prepared by cutting into the bark of trees such as Hevea Braziliensis, gutta-percha, and balata, to draw off milky-white sap and coagulating fine particles of rubber hydrocarbons contained in the resulting sap with acid; and contain rubber hydrocarbons at about more than 60% by weight. Natural rubbers derived from Hevea Braziliensis contain cis-type rubber hydrocarbons, and natural rubbers derived from gutta-percha and balata contain trans-type rubber hydrocarbons. These natural rubbers can be used singly or in combination of two or more.

[0019]

The weight average molecular weight of natural rubbers is preferably 200,000 to 400,000, and more preferably 250,000 to 350,000. Thus, a gum base composition can have an appropriate elasticity. The natural rubbers are contained in a gum base composition preferably at 5 to 20% by weight, more preferably at t5 to 15% by weight.

[0020]

[Resins]

Examples of resins include natural resing and ester gums. Natural resins contain rubber hydrocarbons at about 4 to 24% by weight, and have the weight average molecular weight of about 7000 to 250,000, examples of which include chicle, Jelutong, and Sorba. Each of these natural resins is composed of different components, and thus, has characteristic chewing texture and flavor. These natural resins can be used singly or in combination of two or more. The natural resins are contained in a gum base composition preferably at 10 to 40% by weight, more preferably at 10 to 30% by weight.

[0021]

Ester gums are ester compounds of rosin or its derivatives such as polymers, and can be added to chewing gum so as to provide a texture that resembles that of a natural resin (chicle) or to improve a chewing texture of chewing gum. Examples of the ester gums include purified rosin esters, hydrogenated rosin esters, disproportionated rosin esters, and polymerized rosin esters. These ester gums are each composed of different components, thereby provide characteristic chewing textures and further affect the impression of flavor upon chewing the resulting chewing

gum. These ester gums can be used singly or in combination of two or more. The ester gums are contained in a gum base composition preferably at 5 to 25% by weight, more preferably at 5 to 20 % by weight.

[0022]

(D) Fillers, Plasticizers and/or Emulsifiers, Waxes and Others

Examples of fillers include calcium carbonate, calcium phosphate, and talc. Calcium carbonate and calcium phosphate are used for a gum without an acidifying agent, and talc is used for a gum with an acidifying agent. Fillers are contained in a gum base composition preferably at 10 to 15% by weight.

[0023]

Examples of plasticizers include acetylated monoglycerides, triacetin, and polyglycerols. Acetylated monoglycerides are preferred. Examples of emulsifiers include glycerin fatty acid esters, sorbitan fatty acid esters, and lecithin. These plasticizers or emulsifiers can be used singly or in combination of two or more. The plasticizers and/or emulsifiers are contained in a gum base composition preferably at 4 to 19% by weight.

[0024]

Examples of waxes include microcrystalline wax, rice wax, chandelila wax, and carnauba wax. Microcrystalline wax is preferable because of its wide applicability. Waxes are preferably contained in a gum base composition at 5 to 30% by weight.

[0025]

A gum base composition of the present invention can further contain chewing bases such as starch derivatives and hydrogenated oils.

[0026]

A gum base composition of the present invention can be obtained by mixing the aforesaid polylactic acid (A) and at least one of the components in (B)-(D).

[0027]

When polylactic acid (A) and at least one of the components in (B)-(D) are mixed, the order of the mixing is not critical. It is preferable to prepare a polylactic acid mixture for use by preliminarily mixing polylactic acid (A) and plasticizers and/or emulsifiers in (D) in order to facilitate mixing of polylactic acid (A), natural rubbers (B), and resins (C). The polylactic acid mixture can be obtained, for example, by heat kneading polylactic acid at 110°C to 120 °C in a

pressure kneader and adding wax into the resulting softened polylactic acid. The mixing ratio of polylactic acid (A) to plasticizers and/or emulsifiers in (D) is preferably 90:10-80:20 by weight.

[0028]

Further, it is preferable to prepare a natural rubber mixture for use by preliminarily mixing natural rubbers (B) and waxed in (DO so as to be able to carry out mixing of polylactic acid (A) and at least one of the components in (B) to (D) at a low temperature. The natural rubber mixture has a melting point which is lower than that of natural rubbers (B), thereby is able to prevent other components from thermal decomposition. The natural rubber mixture can be prepared by kneading natural rubbers (B) in a pressure kneader and mixing with waxes in (D). The mixing ratio of natural rubbers (B) to waxes in (D) is preferably 30:70-40:60 by weight.

[0029]

A gum base composition of the present invention can be obtained, for example, by mixing the aforesaid preliminarily mixed polylactic acid mixture, the aforesaid natural rubber mixture, components in (C), and components in (D), depending on desired chewing texture. More specifically, it is preferable to include polylactic acid, natural rubbers, natural resins, ester gums, acetylated monoglycerides, microcrystalline wax, fatty acid monoglycerides, and calcium carbonate.

[0030]

A gum base composition of the present invention has processibility and chewing texture comparable to conventional gum bases, and is excellent in disintegratability and biodegradability. A desired chewing gum can be obtained by adding commonly used non-chewable ingredients such as sweeteners, softening agents, coloring agents, flavors, and acidifiers to a gum base composition of the present invention. This chewing gum has texture comparative to conventional chewing gums, as well as long lasting flavor.

[0031]

[Examples]

The present invention is further explained by the following examples; it is to be expressly understood, however, that the present invention is not limited by the said examples.

[0032]

(Examples 1-3)

Polylactic acid (Mitsui Chemicals) having the weight average molecular weight of 100,000 and the softening temperature of 60°C and an acetylated monoglyceride (Riken Vitamin) were mixed at a ratio of 9:1 by weight at 110-120 °C in a heating kneader; and then the mixture was cooled to prepare a solid polylactic acid mixture (see (1) in Table 1). Separately, natural rubber (a product of Malaysia) and microcrystalline wax (Nippon Seiro Co., Ltd.) were mixed at a ratio of 4:6 by weight in a pressure kneader to prepare a natural rubber mixture (see (2) in Table 1). Subsequently, the polylactic acid mixture, the natural rubber mixture, and each of the components of (3)-(8) shown in Table 1 were mixed at 110-120°C at the ratios (by weight) shown in Table 1 in an ordinary kneader to obtain individual gum base compositions.

[0033]

The gum base compositions thus obtained were extruded using a kneader-ruder, allowed through in cooling water, and then spread to a final gum thickness of 1mm using a rolling mill roll. Stability, disintegratability, and biodegradability of the spread gum base compositions were evaluated as follows. The results are shown in Table 2.

[0034]

The stability of the gum base compositions was evaluated by a weather resistance test. The gum base compositions were stored for 6 months under the conditions equivalent to those of outdoor exposure test, and the evaluation was carried out with the gum base compositions after storage according to the following evaluation standard.

(Evaluation standard)

No change in appearance: ○

Partially disintegrated or degraded: x

[0035]

The disintegratability of the gum base compositions was evaluated by a hydrolysis test. The gum base compositions were stored for 6 months in water at 60 °C, and the evaluation was carried out with the gum base compositions after storage according to the following evaluation standard.

(Evaluation standard)

Disintegrated: ○

No change in appearance: x

[0036]

The biodegradability of the gum base compositions was evaluated by an activated sludge-burying test and a soil-burying test. The gum base compositions were stored for 6 months under the following test conditions and the evaluation for each test was carried out with the gum base compositions after storage according to the following evaluation standard.

(Test conditions)

Activated sludge-burying test: Stored at normal temperature in drain sludge

Soil-burying test: Stored at normal temperature in garden soil

(Evaluation standard)

Disintegrated or degraded: ○○

Partially disintegrated or degraded: ○

No change in appearance: x

[0037]

[Comparative Examples 1-3]

Polyvinyl acetate (Wacker) and microcrystalline wax were mixed at 110-120 °C at ratio of 9:1 by weight, and then the mixture was cooled to prepare a solid polyvinyl acetate mixture (see (1) in Table 1). Separately, butyl rubber (Exxon) and microcrystalline wax (Nippon Seiro Co., Ltd.) were mixed at a ratio of 4:6 by weight in a pressure kneader to prepare a butyl rubber mixture (see (2) in Table 1). Then, in the same manner as described in Examples 1-3, bum base compositions were produced by mixing the polylactic acid mixture, the natural rubber mixture, and each of the components of (3)-(8) shown in Table 1 at ratios (by weight) shown in Table 1, and stability, disintegratability, and biodegradability of the gum base compositions were evaluated. The results are also shown in Table 2.

[0038]

[Table 1]

Ingredients	Example			Comparative Example		
	1	2	3	1	2	3
(1) Polylactic acid (polyvinyl acetate) mixtures						
Polylactic acid	10.8	29.7	49.5	-	-	-
Polyvinyl acetate	-	-	-	10.8	29.7	49.5
Acetylated monoglycerides	1.2	3.3	5.5	1.2	3.3	5.5
(2) Natural rubber (butyl rubber) mixtures						
Natural rubber	9	7	5	-	-	-
Butyl rubber	-	-	-	9	7	5
Microcrystalline wax	13.5	10.5	7.5	13.5	10.5	7.5
(3) Natural resins	20	10	0	20	10	0
(4) Ester gums	15	10	7	15	10	7
(5) Acetylated monoglycerides	4	8	9	4	8	9
(6) Microcrystalline wax	10	8.5	4.5	10	8.5	4.5
(7) Fatty acid monoglycerides	2	2	2	2	2	2
(8) Calcium carbonate	14.5	11	10	14.5	11	10
Total	100	100	100	100	100	100

The figures are parts by weight.

[0039]

[Table 2]

Evaluation	Test	Example			Comparative Example		
		1	2	3	1	2	3
Stability	Weather tolerance test	○	○	○	○	○	○
Disintegratability	Hydrolysis test	○	○	○	x	x	x
Biodegradability	Activated sludge-burying test	○	○○	○○	x	x	x
	Soil-burying test	○	○	○	x	x	x

[0040]

From the results shown in Table 2, it is revealed that the gum base compositions in Examples have stability equivalent to that of Comparative Examples at normal temperature. Further, it is revealed that the gum base compositions of Comparative Examples are neither disintegrated nor degraded whereas the gum base compositions of Examples are disintegrated by hydrolysis and degraded in an environment with abundant microorganisms, such as soil and activated sludge.

[0041]

[Examples 4-6]

The gum base compositions prepared in Examples 1-3 were blended at ratios (by weight) shown in Table 3 to prepare chewing bums using a blender. The resulting chewing gums were taken out of the blender, extruded using an extruder, and rolled and formed into gums having a size of 1.9 mm x 19 mm x 73 mm using multiple stand mill rolls.

[0042]

Five expert panelists were required to test the resulting rolled and formed chewing gums for 5 minutes. Chewing texture and flavor lastingness after chewing for 5 minutes were organoleptically evaluated using a scoring range of 0 to 100. The evaluation method used is an absolute evaluation by individuals, with 100 as the best score. The results are shown in Table 4. The results in Table 4 show the averages of the scores by the five expert panelists (decimal numbers were rounded off).

[0043]

[Comparative Examples 4-6]

The gum base compositions prepared in Comparative Examples 1-3 were blended at ratios (by weight) shown in Table 3 to prepare chewing gums using a blender. Then, in the same manner as described in Examples 4-6, chewing texture and flavor lastingness of the chewing gums were organoleptically evaluated. The results are also shown in Table 4.

[0044]

[Table 3]

		Examples			Comparative Examples		
		4	5	6	4	5	6
Gum base compositions used		1	2	3	1	2	3
Blend	Gum base composition	25	25	25	25	25	25
	Sugar	63	63	63	63	63	63
	Glutinous starch syrup	10	10	10	10	10	10
	Glycerin	1	1	1	1	1	1
	Flavors	1	1	1	1	1	1
Total		100	100	100	100	100	100

The figures are parts by weight.

[0045]

[Table 4]

	Example			Comparative Example		
Organoleptic evaluation	4	5	6	4	5	6
Chewing texture	94	76	57	95	78	55
Flavor lastingness	91	76	55	90	77	50

The figures are averages (decimal numbers are rounded off).

[0046]

From the results shown in Table 4, it is revealed that the chewing gums of Examples 4-6 have the chewing texture and flavor lastingness equivalent to those of chewing gums of corresponding Comparative Examples 4-6.

[0047]

[EFFECTS OF INVENTION]

Gum base compositions of the present invention have the processibility and a chewing texture equivalent to that of conventional gum base compositions and are excellent in disintegratability and biodegradability. Chewing gums produced using the gum base compositions of the present invention have a chewing texture equivalent to that of conventional chewing gums, as well as long-lastingness of flavor.

Title of Document: Abstract of Invention

[Abstract]

[PROBLEMS TO BE SOLVED] The present invention intends to provide a gum base composition which has an excellent chewing texture and is excellent in disintegratability and biodegradability.

[MEANS FOR SOLVING PROBLEMS] The present invention provides a gum base composition comprising biodegradable ingredients, wherein said biodegradable ingredients include a polylactic acid in the amount of from 10% by weight to less than 50% by weight. The weight average molecular weight of the polylactic acid used is preferably 50,000 to 200,000.

Figure to be selected: None

Applicant's History Information

Identification No. 591177749

1.	Date of Update:	February 10, 1998
	[Reason for Update]:	Change of Address
	Address:	7-18, Nishinomiyahama 4-chome, Nishinomiya-shi, Hyogo
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Applicant's History Information

Identification No. 502268140

1.	Date of Update:	July 24, 2002
	[Reason for Update]:	New Registration
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